Force:

- mass x acceleration
- Something that causes an object to move
- Newtons 2nd law (all ...)
- Measured in Newtons
- vector?
- friction... now or later?
- relationship with pressure?
- how much is 1 N, practically?
- forces act on everything constantly
- keeps stuff stable

- Ways to apply force:
  1. Contact
  2. Field

- Examples:
  1. Applied, friction, normal, spring
  2. Gravitational, electric, magnetic, weak, strong

Newton's Laws:

1. Object in motion/at rest stays in motion/at rest unless acted upon by outside force.
2. $\sum \bar{F} = m\bar{a}$

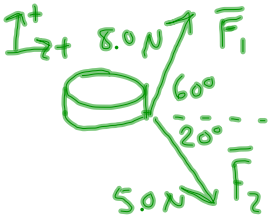
$$\sum \bar{F}_x = m\bar{a}_x \quad \sum \bar{F}_y = m\bar{a}_y$$

3. Forces come in pairs.

Force:	How transferred:	
Weight → force due to gravitational attraction	Field	$\bar{F}_w = m\bar{a}_g$
Normal → always perpendicular to a surface	Contact	$\bar{F}_N$
Friction → Two types: Static, Kinetic. Coefficient of friction for each	Contact	$\bar{F}_f = \mu \bar{F}_N$
Spring → restoring force. All springs have a spring constant (k)	Contact	$F_s = -kx$

Force Notes and Practice Problems

A hockey puck having a mass of 0.30 kg slides on the horizontal, frictionless surface of an ice rink. Two hockey sticks strike the puck simultaneously, each exerting a force. The first stick's force is 5.0 N at 20 degrees south of east, and the second stick's force is 8.0 N at 60 degrees north of east. Determine both the magnitude and the direction of the puck's acceleration.



$\sum \vec{F} = m\vec{a}$

1) $\sum F_x = ma$

$F_{1x} + F_{2x} = ma_x$

$a_x = \dfrac{F_{1x} + F_{2x}}{m}$

$= \dfrac{(8.0\,N)\cos(60°) + (5.0\,N)\cos(20°)}{(.30\,kg)}$

$= 29\ m/s^2$

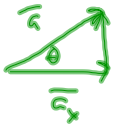
$\sum F_y = ma_y$

$F_{1y} + F_{2y} = ma_y$

$a_y = \dfrac{F_{1y} + F_{2y}}{m}$

$= \dfrac{(8.0\,N)\sin(60°) - (5.0\,N)\sin(20°)}{(.30\,kg)}$

$= 17.3\ m/s^2$



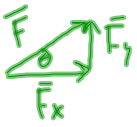
$\vec{a} = 33.7\ m/s^2$ @ 31° N of E

2) $\sum F_x = F_{1x} + F_{2x}$

$= 8.69\,N$

$\sum F_y = F_{1y} + F_{2y}$

$= 5.24\,N$



$a = \dfrac{F}{m}$

$= 33.7\ m/s^2$

Units: newtons

$$1\ N = 1\ \frac{kg \cdot m}{s^2}$$